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PATENT

UNITED STATES PATENT APPLICATION

of

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for

AMUSEMENT RIDE WITH CABLE-LAUNCHED CARRIER

BACKGROUND OF THE INVENTION

FIELD OF THE INVENTION

This invention relates to an amusement ride that uses cables to elevate a carrier for one or more participants between a multitude of towers.

DESCRIPTION OF THE RELATED ART

United States patent no. 5,632,686 employs a multitude of towers and cables to elevate a carrier for participants. There is no indication, however, that at least the top portion of the towers would be flexible. In fact, the arches shown in Figure 4 between adjacent towers suggests that there is no such flexibility.

Several patents, *e.g.*, United States patent numbers 5,421,783; 5,649,866; and 5,810,671 have a passenger carrier that is accelerated upward by bungee cords and can relatively freely swing about the ends of such cords. Patent number 5,649,866 uses three towers; patent numbers 5,421,783 and 5,810,671 utilize three towers. No mention is made of any flexibility in the towers of these patents. The lattice construction shown in the drawings of patent numbers 5,649,866 and 5,810,671 imply that there would be no such flexibility. Indeed, lines 56 through 56 in column 2 of patent number 5,649,866 refer to the towers as "three upstanding, stationary towers"; and lines 32 through 33 in column 2 of patent number 5,8180,671 use the descriptive terminology "pair of spaced, stationary towers." The relatively short height of the towers shown in the drawings for patent number 5,421,783 provides a similar implication. And, in fact, line 11 in column 6 of that patent describes the towers as being "rigid structures."

The passenger carrier in patent numbers 5,421,783; 5,649,866; and 5,810,671 that is accelerated upward by bungee cords can relatively freely swing about the ends of such cords. There is, however, no controlled rotation of the carrier; patent number 5,810,671, in lines 2 through 5 of column 7, merely indicates that, by "shifting their weight" participants can cause the carrier of the invention to commence rolling.

United States patent no. 6,083,111 does involve controlled rotation of a passenger chair (also termed a "support") for an amusement ride. The degree of rotation is, however, purposefully limited; the limited rotation that is possible apparently occurs only over a restricted,

fixed portion of a course upon a tower; and only downward movement occurs when the chair has been rotated from its initial substantially vertical position.

Lines 31 through 37 in column 2 of patent no. 6,083,111 explain, "The passenger support, together with the passenger, is tilted forward into a falling orientation which is at a predetermined tilt-angle to the pre-fall orientation. The passenger support, together with the passenger, is dropped or propelled from the drop position to a lower position while the passenger support and the passenger are in the forward tilted falling orientation . . . ."

Lines 3 and 4 in column 3 further clarify, "for safety reasons, the tilt-angle of the passenger and the passenger support is limited . . . ."

Patent no. 6,083,111 continues, in lines 26 through 28 of column 3, by asserting, "A travel course for the carriage is established by engaging a guide that is connected to the carriage upon an elongate rail or track that is coupled to an elevating tower."

Lines 23 through 25, 39 through 42, and 46 through 49 of column 3 state, "The degree of tilt between the pre-fall orientation **92** and the falling orientation **95** is predetermined and restricted . . . . When the latching mechanism **40** is released, the passenger support **22** is permitted to tilt or be tilted from the pre-fall orientation **92** toward and into the falling orientation **95**. . . . Alternatively, the tilting action can be induced by an operating mechanism B43B which in the described embodiment is a rotary motor and may be exemplarily electromechanical, hydraulic or other suitable configuration."

Lines 39 through 46 and 55 through 57 of column 6 consistently provide, "Upon reaching the drop position **70**, the passenger support **22** is permitted to tilt, or is tilted from the upright and sitting pre-fall orientation **92** to the tilted falling orientation **95**. To accomplish such tilting, the latching mechanism **40** is released and the passenger **55** is either motored to the tilted position using the operating mechanism **43** or the support **22** is simply allowed to drop to the tilted position and falling orientation **95** under the passenger's **55** own weight. . . . The tilting action is accommodated by the pivot connection **37** and is limited either by the operating mechanism **43** or appropriate stops." Then line 67 of column 3 through line 2 of column 7 declares, "Either simultaneously or shortly thereafter, the carriage **34** begins to drop over a falling travel distance **73**."

Finally, with respect to patent number 6,083,111, lines 53 through 56 in column 7 observe, "The maximum safe tilt angle **98** is experimentally determined and then the actual tilt angle **98** is restricted within a range between that determined angle and the upright position."

Furthermore, none of the preceding patents has a restraint system for the participant which employs a harness releasably held in place through the insertion of a serrated rod into an aperture of a directionally biased block.

Patent number 5,632,686 does not discuss a restraint system. Lines 20 and 21 of column 7 in patent number 5,421,783 simply note, ". . . each rider is strapped in with dual shoulder belts and a standard lap belt." Patent number 5,649,866, in lines 58 through 61 of column 3, and patent number 5,810,671, in lines 24 through 27, utilize identical language: "Associated with each seat **58** is a five-point harness assembly **60** for securing an individual within the seat **58** when an individual is seated therein." And patent no. 6,083,111, in lines 6 through 17 of column 5, provides, "The carriage **34** has a passenger support or car **22** mounted thereupon. The passenger support **22** includes a chair-type structure upon which the passenger **55** directly rests. The chair includes a headrest, restraint **31** for retaining the passenger **55** safely in the support **22** throughout the ride's **10** cycle. The restraint **31** is pivotally connected at an upper portion **28** of the passenger support **22**. Supplemental restraints may also be included as required or desired. The several restraints however, are of conventional design and well-known in the amusement ride arts."

And none of the preceding patents includes a device for maintaining tension in a cable which assists in providing the propulsive force to the carrier for the participant or participants on an amusement ride.

Examples of patents which apply to fluid-powered cylinders associated with cables for powring amusement rides are United States patent numbers 5,632,686; 5,704,841; 5,893,802; 6,001,022; and 6,176,788.

SUMMARY OF THE INVENTION

The present invention utilizes cables suspended from a multitude of towers, preferably an odd number of towers and most preferably three towers, to raise a carrier for passengers.

Any means for causing the end of a cable attached to the carrier to move in a desired direction that is known in the art may be employed. This includes, but is not necessarily limited to, a high-speed winch or a fluid-powered cylinder. The propulsive force may be applied to the cable either at the end of the cable other than the end which is attached to the carrier or, preferably, at a point intermediate between the ends of the cable.

At least the upper portion at least one of the towers and, preferably, all of the towers is flexible. Movement of the towers in response to acceleration of the carrier cushions the carrier and, consequently, participants on the carrier.

Preferably, but not necessarily, the carrier has one or more controllably rotatable seats.

Also preferably, but not necessarily, participant are held to their seats with harnesses attached to one or more serrated rods, wherein each serrated rod is inserted into an aperture of a directionally biased block.

And, optionally, a device for maintaining tension in a cable is employed for the cables.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 depicts the Amusement Ride with Cable-launched Carrier with a means for propelling a carrier attached to a first end of cables from towers.

Figure 2 illustrates the Amusement Ride with Cable-launched Carrier with a means for propelling a carrier connected at an intermediate point on each cable.

Figure 3 shows the connection of a fluid-powered cylinder having a continuous cable to the first end of a cable.

Figure 4 portrays the attachment of a fluid-powered cylinder having a continuous cable at an intermediate point on a cable.

Figure 5 demonstrates the connection a fluid-powered cylinder having a non-continuous cable to the first end of a cable.

Figure 6 is a view showing the attachment of a fluid-powered cylinder having a continuous cable at an intermediate point on a cable.

Figure 7 shows a first view of the Controllably Rotatable Seat.

Figure 8 provides an alternate view of the Controllably Rotatable Seat.

Figure 9 depicts a target on a tower to be detected by a sensor associated with the Controllably Rotatable Seat.

Figure 10 provides a normal view of the Locking Apparatus.

Figure 11 is an exploded view of the Locking Apparatus.

Figure 12 shows a rod having its second end in the shape of a loop.

Figure 13 illustrates a rod having screw threads on its second end.

Figure 14 depicts a spring used at the end of a cable to reduce slackness.

Figure 15 shows a weight attached to the end of a cable to reduce slackness.

Figure 16 illustrates a cylinder connected to the end of a cable to reduce slackness.

Figure 17 portrays a spring used at an intermediate point of a cable to reduce slackness.

Figure 18 demonstrates a weight used at an intermediate point of a cable to reduce slackness.

Figure 19 shows a cylinder pushing against a cable at an intermediate point to reduce slackness.

Figure 20 illustrates a cylinder pulling against a cable at an intermediate point to reduce slackness.

Figure 21 shows The Amusement Ride with Cable-launched Carrier having a fluid-powered cylinder with a non-continuous cable connected, oriented with the valve for supplying fluid downward, connected at an intermediate point of the cable which has a pressurizable cylinder connected to the first end of said cable.

DESCRIPTION OF THE PREFERRED EMBODIMENT

As its name implies, the Amusement Ride with Cable-launched Carrier has, as illustrated in Figure 1 and Figure 2, a cable **302** suspended from a tower **401**. Preferably, there are a multitude of cables **302** and towers **401**, more preferably and odd number, and most preferably three.

At least the upper portion **402** of at least one tower **401** and, preferably of all the towers **401**, is flexible.

A means **421** for propelling a carrier **303** for one or more participants is attached either to a first end **304** of each cable **302** or at an intermediate point between the first end **304** and the second end **305** of a cable **302**. The second end **305** of each cable **302** is connected to the carrier **303**.

This means can be any mechanism that is well known in the art for propelling a carrier **303** of an amusement ride. For example, it can be a high-speed winch, a fluid-powered cylinder having a continuous cable, or a fluid-powered cylinder having a non-continuous cable.

Figure 3 shows a fluid-powered cylinder **403** having a continuous cable **404** attached to the first end **304** of the cable **302** which propels the carrier **303**. The first end **304** is merely connected to the continuous cable **404**.

The continuous cable **404** can, alternatively, be connected at an intermediate point of the cable **302**, as portrayed in Figure 4. In this embodiment, a first end **405** of a transfer cable **406** is connected to the continuous cable **404**; and a second end **407** of the transfer cable **406** is connected to a slide **408** through which the cable **302** can substantially freely move. The first end **304** of the cable **302** is attached to any structure **423** which will hold such first end **304** substantially stationary; and the slide **408** is preferably, but not necessarily, a pulley.

A fluid-powered cylinder **403** having a non-continuous cable is attached to the first end of the cable **302** by merely having the first end **304** of the cable **302** connected to a piston **409** slidably mounted within the cylinder **403**, as depicted in Figure 5.

When a fluid-powered cylinder **403** having a non-continuous cable is connected at an intermediate point of the cable **302**, this is done exactly as in the case of the continuous cable except that the first end **405** of the transfer cable **406** is attached to the piston **409**, as portrayed in Figure 6. And, with respect to the embodiments of the fluid-powered cylinder **403** discussed so

far, the term transfer cable **406** includes not only a flexible cable, but also a rod. Moreover, the term cable **302** for any portion of the cable **302** which enters the fluid-powered cylinder **403** also, but not preferably, includes a non-flexible structure such as a rod.

Each fluid-powered cylinder **403** has an aperture **410** in a first end **411** of said cylinder **403** through which the cable **302**, **404**, or **406** passes. The fluid-powered cylinder **403** having a continuous cable also has an aperture **412** in a second end **422** of the cylinder **403** through which the cable **404** passes before connecting to the piston **409**. The second end **422** can actually be either open or closed.

In or near, *i.e.*, closer than the piston **409** will ever be, to the first end **411** is a valve **413** for injecting the fluid to propel the piston **409** and, consequently, the carrier **303**. Either this valve **413** or a separate descent valve **414** communicating with the interior **415** of the cylinder **403** can, when necessary, be utilized to reduce fluid in order to facilitate the return of the piston **409** and, consequently, the carrier **303**, to its original position. Optionally, the cylinder **403** may contain an aperture or valve **416** in the side **417** of the cylinder **403** to reduce pressure and thereby facilitate movement of the piston **409** before it reaches the aperture or valve **416** as well as reducing pressure after the piston **409** has passed the aperture or valve **416** in order to assure that the piston **409** and, consequently, the carrier **303** is not propelled too forcefully.

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A controllably rotatable seat has a seat **1** attached to an arm **2** that is rotated by a means for rotating **3** which is preferably an electric motor but which can be pneumatics, hydraulics, or any other mechanism that is well known in the art for producing rotation. (The term "seat" is used herein to mean either a single seat or a group of two or more seats.)

Preferably, but not necessarily, a lever arm **4** connects the arm **2** to the means for rotating **3** so that the point of rotation of the means for rotating **3** will be substantially aligned with the center of gravity of a participant sitting on the seat **1**.

Also preferably, but not necessarily, the lower portion **5** of the seat **1** is a saddle seat, *i.e.*, it is formed in substantially the same shape as a saddle for a horse, in order to cause the participant to feel exposed to excitement.

The arm **2** and, consequently, the seat **1** can preferably, but not necessarily, rotate at least ninety degrees.

Preferably, but not necessarily, there would also be a means for retaining the participant to the seat **1**, such as a harness.

The arm **2** and the means for rotating **3**, as well as the lever arm **4** when employed, are attached to the carrier **303**. Attachment of the arm **2**, and the lever arm **4** when employed, is a rotatable attachment to the carrier **303**.

A timer **9** communicating with the means for rotating **3** can be programmed with the time to commence rotation and the time to begin rotating the seat **1** to its original orientation.

Alternatively, a target **10** can be located on a tower **401** at a point where rotation is desired to commence as the seat **1** passes the target **10**, and a second target **11** can be placed on a tower **401** at a point where it is desired to have the seat **1** start rotating back to its original orientation. A sensor **12** capable of detecting the targets **10, 11** would be mounted on the carrier **303** and communicate either directly or through a preferably, but not necessarily, programmable, logic unit **13** such as a computer with the means for rotating **3**. Optionally, only a single target **10** would be employed; and the seat **1** would start rotating as it passed the target **10** going in a first direction and would begin rotating to its original orientation as it passed the target **10** going in the substantially opposite direction.

A device known in the art for measuring distances could also determine the distance between a known elevation (or other position) and the carrier **303**. Such device communicates through a, preferably, but not necessarily, programmable, logic unit **13** such as a computer with the means for rotating **3**. Initial rotation would commence at a given distance, and rotation back to the original orientation of the seat **1** would begin at another specified distance, with such criteria either set into the logic unit **13** at the factory or, when the logic unit is programmable, programmed into the logic unit **13** by a user. Communication in this embodiment would preferably, but not necessarily, be by digitally encoded radio signals.

Finally, any device well known in the art for measuring the distance a cable **302** moves could function just as does the device for measuring distances discussed in the preceding paragraph.

Also, as discussed above, any device known in the art for measuring speed or acceleration or any other measurable criterion associated with the amusement ride could

determine the time for rotation and the time for return of the seat **1** to its original orientation just as discussed for the device for measuring distances.

And, preferably, but not necessarily, the means for retaining the participant to the seat **1** includes a harness **418** attached to a locking apparatus **419**.

The locking apparatus has a block **101** containing an aperture **102**. The block is attached to the seat **1**.

A rod **103** is removably insertable into the aperture **102**. The rod **103** is serrated, *i.e.*, the thickness of the rod **103** varies periodically along a portion **104** of the length of the rod **103** beginning near a first end **105** of the rod **103**.

The maximum periodic thickness **106** of the rod **103** is less than the minimum diameter of the aperture **102** in the block **101** so that the rod **101** can be inserted into the aperture **102**.

Between the center of the aperture **102** and a first end **107** of the block **101**, the block is rotatably attached to a support structure **108**. The block **101** is biased so that the second end **109** of the block **101** is farther toward the direction from which the rod **103** is intended to be inserted that is the first end **107** of the block **101**. Preferably, but not necessarily, such biasing is done between the center of the aperture **102** and a second end **109** of the block **101**.

The biasing of the block **101** reduces the minimum diameter of the aperture **102** as projected perpendicular to the longitudinal axis of the rod **103**. The projected minimum diameter of the aperture **102** is then less than the periodic maximum diameter **106** of the rod **103** so that pushing the rod **103** into the aperture **102** tends to decrease the biasing, thereby increasing the minimum projected diameter of the aperture **102**, until the minimum projected diameter of the aperture **102** exceeds the periodic maximum diameter **106** of the rod **103** so that the rod **103** can enter the aperture **102**. Continuing to push the rod **103** enables it to proceed farther into the aperture **102**. As the rod **103** is pushed farther into the aperture **102**, however, the biasing pushes the edge of the aperture **102** into a portion of the rod **103** between periodic maximum diameters **106**. Then attempting to withdraw the rod **103** causes the rod **103** to pull the block **101** and thereby either maintain or increase the biasing, which consequently reduces the projected diameter of the aperture **102** and precludes withdrawal of the rod **103**.

Biasing may be accomplished by any device **110**, such as a spring that will exert a physical force between the block **101** and the support structure **108**. Preferably, but not

necessarily, the block **101** contains a first depression **111** to hold a first end **112** of the device **110**; and preferably, but not necessarily, the support structure contains a second depression **113** to hold a second end **114** of the device **110**.

The second end **115** of the rod **103** is available for connection to a restraining device such as the cloth of a seat belt or a bar and is shaped to accommodate such restraining device. This shape is generally a loop for a seat belt or screw threads for insertion into a bar.

The further the rod **103** is pushed into the block **101**, the tighter the restraint will be.

Any means well known in the art for applying a physical force is used to push against or pull the block **101** to reduce the biasing. Such a means may, *e.g.*, be a manually operated rod or lever, a cable attached to the block **101** to pull the block **101**, a motor, a hydraulically powered rod to push the block **101**, or a pneumatically powered rod to push the block **101**.

Finally, a sensor **116** of any type known in the art for indicating the presence of the rod **103** within the block may be utilized. This could, for example, be a contact sensor or a light sensor.

Optionally, the Amusement Ride with Cable-launched Carrier includes a device for maintaining tension in a cable. In some embodiments of such a situation, as will be more fully explained below, the first end **304** of the cable **302** is allowed to move somewhat.

When the propulsive force for the carrier **303** is applied at an intermediate point of the cable **302**, in order to reduce slackness in the cable **302** as the carrier **303** approaches its upper vertical limit, a means is employed for applying a pulling force along the cable **302** in the direction away from the carrier **303** to which such cable **302** is attached. This pulling force is applied to the end **304**, designated the first end, of the cable **302** other than the end **305**, designated the second end, that is connected to the carrier **303**. In such a circumstance, the first end **304** of the cable **302** is not connected to a structure **423** which will hold such first end **304** substantially stationary.

Examples of devices which can create the pulling force are a spring **306** having a first end **307** connected to the first end **304** of the cable **302** and a second end **308** connected to an object **309** which is so heavy that movement of the carrier **303** will not appreciably move the object **309**, as illustrated in Figure 14; a weight suspended from the first end **304** of the cable, as shown in Figure 15; and a pressurizable cylinder **310** connected to the object **309** and having a rod **311**

extending through an end **312** of the cylinder **310** with the first end **313** of the rod **311** attached to a piston **314** slidably mounted within the cylinder **310** and the second end **315** of the rod **311** attached to the first end **304** of the cable **302**, as portrayed in Figure 16. Alternatively, the rod **311** can be eliminated; and the cable **302** is then connected directly to the piston **314**. The object **309** is preferably the earth or a structure attached to the earth. The pressurizable cylinder **310** has an aperture **316** connected to a source **317** of compressed fluid, preferably a gas, through a pressure regulator **318**; such aperture **316** is preferably near the end of the pressurizable cylinder **310** through which the rod **311** extends. Also, an aperture **319** exists in the end **312** of the cylinder to allow the rod **311** or cable **302** to pass through the end **312**.

Of the various devices, the pressurizable cylinder **310** is preferred.

In order to reduce slackness in the cable **302** when the propulsive force for the carrier **303** is applied at the first end **304** of the cable **302**, a means for applying a force substantially transverse to the cable **302** at an intermediate point of the cable **302** is utilized.

One example of such a means is, as shown in Figure 17, a spring **321** having a first end **322** attached to a slide **323** through which the cable **302** can substantially freely move and a second end **323** attached to a rigid structure **324**, which could, for example, be a tower **401** from which the cable **302** is supported. The slide **323** can, but need not, totally encircle the cable **302**; it is sufficient that the slide **323** goes far enough around the cable **302** to prevent the cable **302** from slipping away from the slide **323**.

Another example of a means for applying the substantially transverse force is, as illustrated in Figure 18, a line **325** that has a first end **326** attached to the slide **323** and a second end **327** connected to a weight **328** with the line **325** passing at an intermediate point between the ends **326**, **327** around a substantially horizontal structure **329**, which is preferably a pulley, to suspend the weight **328**.

A third example of a means for applying the substantially transverse force is, as depicted in Figure 19, a pressurizable cylinder **330** connected to the rigid structure **324** and having a rod **311** extending through an end **312** of the cylinder **330** with the first end **313** of the rod **311** attached to a piston **314** slidably mounted within the cylinder **330** and the second end **315** of the rod **311** attached to the slide **323**. The cylinder **330** is constructed just as is the cylinder **310** except that aperture **316** is preferably near the end of the pressurizable cylinder **330** opposite to

the end **312** through which the rod **311** extends because it is desired to have the gas exert a force which tends to push the rod **311** from the cylinder **330** rather than tending to pull the rod **311** into the cylinder **330**.

Still another example of a means for applying the substantially transverse force is portrayed in Figure 20. A pressurizable cylinder **331** is connected to the rigid structure **324**, has a force transferring device **332**, either a rod or cable, with the first end **313** of the force transferring device **332** attached to the piston **314**, and has the second end **315** of the force transferring device **332** connected to the slide **323**. In all other respects the pressurizable cylinder is the same as pressurizable cylinder **310**.

The most preferred embodiment of the Amusement Ride with Cable-launched Carrier comprises three towers **401**, each tower suspending a cable **302**, with at least one of said towers **401** having a flexible upper portion **402**; associated with each cable **302**, a fluid-powered cylinder **403** having a non-continuous cable, oriented with the valve **413** downward, and connected to the cable **302** at an intermediate point of the cable **302**; a transfer cable **406** which is flexible and bends around any device **420** for changing the direction of a physical force without creating substantial friction, such as a pulley, so that the transfer cable **406** travels upward before connecting to the slide **408** around the cable **302** in order, as described above, to connect a fluid-powered cylinder **403** to each cable **302**; a pressurizable cylinder **310** connected to the first end **304** of each cable **302** and to the object **309** as the means for applying a pulling force along the cable **302** in the direction away from the carrier **303** to which the cable **302** is attached, with the object **309** located horizontally near the device **420**; for each cable **320**, another device **420** around which the cable **302** passes between the slide **408** and the first end **304** of the cable **302**; and a carrier **303** connected to the second end of each cable **302**.